City of Leesburg

GROWTH MANAGEMENT PLAN
DRAINAGE ELEMENT

Ordinance #xxxx
Exhibit A
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Prepared For:
City of Leesburg
Community Development Department
214 N. Fifth Street
LEESBURG, FLORIDA 34749

Prepared By:
LPG Urban and Regional Planners
1162 Camp Avenue
Mount Dora, Florida 32757

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A. INTRODUCTION

The City of Leesburg is committed to maintaining the quality of its surface waters. The purpose of this element is to provide analysis of the available data regarding the surpluses and deficiencies of the existing drainage infrastructure serving Leesburg residents so the City may adequately plan for the requirements of the projected population and future land use needs. The following data inventory and analysis will lay the foundation for the goals, objectives, and policies, which will ensure that drainage and stormwater management needs are met throughout the planning period.

To adequately regulate stormwater, it is necessary to manage both the quantity and quality of surface drainage runoff as it passes over the ground. This is accomplished through attenuation of stormwater runoff in an effort to reduce downstream peak discharge rates. In addition to attenuation, it is necessary for drainage facilities to serve other important functions such as water quality management and aquifer recharge. Stormwater can carry a number of pollutants and is responsible for over half the pollution load entering Florida's waters. As such, management of stormwater provides the important function of maintaining the water quality of the City's lakes, creeks, and natural wetlands.

The incursion of development involves the placement of streets, sidewalks, buildings, and parking lots over soils and native vegetation. As a result, stormwater, which would naturally percolate into the ground, runs off of the impermeable surfaces, carrying with it litter, pesticides, fertilizers, heavy metals, and other pollutants. In more densely developed urban areas, pollutants such as oil and gasoline can also be transported in stormwater runoff. While in more rural areas, agricultural runoff can contain excessive nutrients, which are harmful to wildlife and pollute our drinking water. Therefore, it is important for the City to ensure that development takes place in a manner that is consistent with the appropriate management of stormwater. The appropriate management of stormwater involves: treatment of stormwater prior to discharge into surface waters, floodwater attenuation to ensure that post-development discharge rates do not exceed the pre-development discharge rates, and design of stormwater facilities to promote recharge to the underlying aquifer systems where applicable.

1. Regulatory Framework

To protect the quality of surface waters, the federal government enacted Section 208 of the Water Pollution Control Act for stormwater management. Additionally, Section 405 of the Federal 1987 Clean Water Act required the Environmental Protection Agency (EPA) to establish permit regulations for stormwater. The State of Florida addresses surface water management in Chapter 62-40 of the Florida Administrative Code (F.A.C.) and defines permit requirements and management responsibilities in Chapter 62-25 F.A.C. One of the primary concerns of the State rule is to be prepared for repeat storm events. The State emphasizes that drainage systems must recover the storm volume within 14 days and the water quality treatment volume within 72 hours after an initial storm event.

The Water Management Districts regulate stormwater management systems via Chapter 40C-42 F.A.C. The Water Management Districts set the criteria for water quality treatment and attenuation of stormwater runoff in ponds or swales and the permitting of these

systems. Included in the water quality volume is what is known as the "first flush". The first flush is known to generally contain the majority of stormwater pollutants. The St. Johns River Water Management District (SJRWMD) regulates the permitting of stormwater facilities within the Leesburg area.

State Mandated Stormwater Regulations

Pollution in stormwater runoff contributes to the reduction in water quality of surface water bodies. Two regulatory programs developed as part of the federal Clean Water Act that address water quality concerns in stormwater runoff include the Total Maximum Daily Load (TMDL) program and the National Pollutant Discharge Elimination System (NPDES). The Florida Department of Environmental Protection (FDEP) administers both of these regulatory programs.

The TMDL and NPDES regulatory programs have a direct impact on the City's stormwater management program in terms of financial commitment to plan and construction of stormwater retrofit projects to improve water quality. A brief description of these two programs is provided.

Total Maximum Daily Load (TMDL) Program

Section 303 (d) of the federal Clean Water Act (CWA) requires the State of Florida to identify waters that are not attaining their designated uses, provide a list of the impaired waters to the Environmental Protection Agency (EPA), and establish a TMDL for each impaired water body. A TMDL is defined as the maximum amount of a given pollutant that a water body can assimilate and still meet its designated use. Designated uses for Florida water bodies are defined in Chapter 62-302, FAC, as follows:

- Class I - Potable Water Supplies,
- Class II - Shellfish Propagation and Harvesting,
- Class III - Recreation, Propagation and Maintenance of a Healthy Well-Balanced Population of Fish and Wildlife,
- Class IV- Agricultural Water Supplies, and
- Class V – Navigation, Utility and Industrial Use.

The natural surface waters located within Lake County (including Lake Griffin, Lake Harris and the Palatlakaha River) has a Class III designated use.

The FDEP prepared a planning list in 1998 of potentially impaired waters (the 1998 303(d) list) and submitted the list to the US EPA. In 1999, the Florida Legislature passed the Florida Watershed Restoration Act (Section 403.067, Florida Statutes), establishing the framework and requirements for implementing a state TMDL program.

The Impaired Surface Waters Rule became effective in the State of Florida on June 10, 2002.

The FDEP is developing, allocating and implementing the TMDL program through a watershed management approach for 29 major hydrologic groups that are based on natural boundaries rather than political boundaries. To streamline the program, these hydrologic basins are organized into five groups of basins (Group 1 through 5).

The City of Leesburg is located within the Upper Ocklawaha River Basin, designated as a Group 1 Basin. TMDLs for Total Phosphorus were adopted for Lake Griffin, Lake Harris and the Palatlakaha River. In addition, TMDLs for Total Nitrogen and BUD were adopted for the Palatlakaha River.

National Pollutant Discharge Elimination System (NPDES) Program

The National Pollutant Discharge Elimination System (NPDES) program was established as the fundamental regulatory mechanism of the Clean Water Act. The initial focus of the NPDES program was controlling targeted point sources, such as industrial and municipal wastewater discharges. Phase II rule of the NPDES Program includes municipal non-point sources, such as stormwater discharges, to further reduce adverse impacts to water quality and aquatic habitat. The City of Leesburg is regulated by NPDES as a small municipal separate storm sewer system (MS4) under the Phase II rule.

During 2006, the City incorporated the following best management practices in their Stormwater Management Program to address each of the required MS4 control measures, including:

- Establish an annual contract with Florida Yards and Neighborhoods to support Public Education;
- Encourage public participation in reducing pollutants in stormwater runoff by using the City's web site and Public Education TV;
- Installing "No Dumping, Drains to Lake" signs on City storm sewer inlets;
- Adopt City Ordinances to establish stormwater management rules for construction sites and new and re-development areas; and
- Update the City's Stormwater Master Plan to further refine the City's Stormwater Management Program and to identify future stormwater retrofit projects to reduce flooding and improve stormwater quality.

The City reviews and evaluates the progress of their NPDES Phase II MS4 program annually and submits a report to the EPA detailing measurable goals achieved during the reporting period.

2. Terms and Concepts

Stormwater is defined as "the flow of water which results from a rainfall event." Other definitions applicable to this Element are:

Attenuation - To limit stormwater flow to reduce downstream impacts.

Basin – A drainage area with the characteristics of either having a single outfall to the receiving water body or being located adjacent to another basin, and conveying its runoff through a drainage structure.

Closed Drainage Basin - A drainage basin with no positive outfall. The discharge from a closed drainage basin is limited to percolation (and other groundwater flow), evaporation and evapo-transpiration.

Conveyance - Transport of stormwater via pipe and/or open channel system(s).

Design Capacity - The amount of flow a storm sewer system is designed to manage, usually expressed in cubic feet per second for flow and cubic-feet or acre-feet for storage.

Design Storm Event - The design storm event is characterized by the frequency, duration, rainfall volume, and distribution of the storm.

Detention Basin or Structure - means a basin or structure, which collects and temporarily stores stormwater for the purpose of treatment through physical, chemical, or biological processes with subsequent gradual release of the stormwater to reduce downstream quality and quantity impacts.

Ditch - An open stormwater conveyance facility with typical side slopes steeper than three units horizontally to one unit vertically.

Drainage Basin - Any land area defined by topographical boundaries from which the runoff collects at a common point and contributes stormwater to a drainage system or receiving waterbody.

Drainage Facilities - means a system of human-made structures designed to collect, convey, hold, divert or discharge stormwater; including, stormwater sewers, canals, detention structures, and retention structures.

Floodplain - An area inundated during a 100-year flood event or identified by the National Flood Insurance Program as an area of flooding on Flood Insurance Rate Maps or Flood Hazard Boundary Maps.

Impervious - Land surfaces which do not allow (or minimally allow) the penetration of water. An increase in the amount of impervious area will increase the rate and volume of runoff from a given drainage basin.

Inlet - A structure which collects stormwater runoff and connects into a conveyance system.

Natural Drainage Features - Naturally occurring features of an area which accommodate the flow of stormwater, such as streams, rivers, lakes, and wetlands.

Outfall - Location where stormwater flows out of a given system. The ultimate outfall of a system is generally a receiving waterbody.

Percolation - The ability of water to pass through a porous medium; in most cases, the soil.

Pervious - Land surfaces which allow the penetration of water. A decrease in pervious area will increase the rate and volume of runoff from a given drainage basin.

Retention - To store stormwater to prevent its discharge into receiving waters or to provide a storage facility for stormwater where no outfall is available.

Retention Basin or Structure - A stormwater facility which has no structural outfall and the discharge from which is limited to percolation, evaporation, and evapo-transpiration.

Sub-basin – A large neighborhood drainage area, which represents the subdivision of a basin on the basis of natural and/or man-made flow patterns within the basin.

Swale - An open stormwater conveyance facility with side slopes typically equal to or greater than three units horizontally to one unit vertically (generally very shallow).

B. DRAINAGE FACILITIES INVENTORY

1. Operational Responsibility

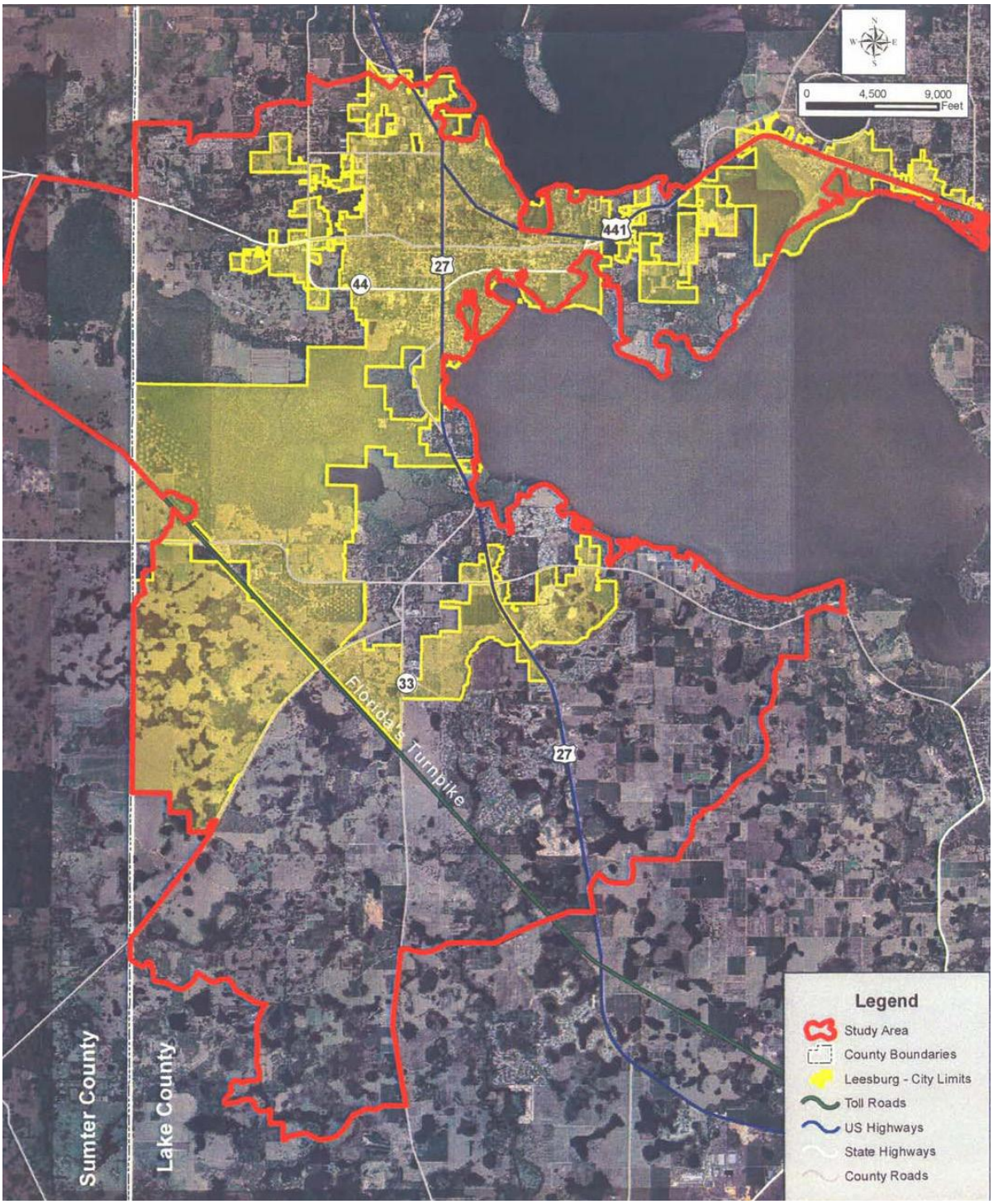
The City of Leesburg, the State of Florida, the Florida Department of Transportation (FDOT), Lake County, and St. Johns River Water Management District are ultimately responsible for maintenance and permitting of the stormwater treatment and conveyance systems within and surrounding the City of Leesburg.

Highways such as U.S. 27, U.S. 441 and S.R. 44, which traverse the City, are completely under the jurisdiction of the FDOT. All stormwater facilities associated with these State highways are designed, operated, and maintained by the FDOT. C.R. 44A, C.R. 44C, 33, and 470, which traverse the City in an east-west direction, are completely under the jurisdiction of Lake County. Likewise, numerous minor and urban collector roads are maintained and operated by the City of Leesburg. In addition to these publicly owned drainage facilities, the City has numerous privately owned drainage facilities which are operated and maintained under a St. Johns River Water Management District Stormwater Permit by either a private company, individual, or homeowners' association. These private drainage facilities typically serve residential subdivisions, multi-family developments, commercial, industrial and agricultural sites.

2. Analysis of Existing Drainage Facilities

In January of 2008 the City of Leesburg received the Stormwater Management Program and Master plan from Boyle engineering referenced extensively in this element. This report was commissioned to further analyze the drainage facilities proposed and constructed and track the changes in the existing drainage basins within the expanded Study Area. The focus of the report is limited to the 82 square mile Study Area delineated on Map VII-1.

Map VII-1 Study Area



a. Drainage Basin Delineation

A total of 17 major drainage basins are defined within the expanded Study Area for this Stormwater Master Plan. Data used to delineate the 17 drainage basin boundaries include:

- USGS 5-foot contour maps,
- Available 1-foot contours,
- Aerial topographic maps for Lake County,
- Recent aerial photography,
- Observations and measurements during field reconnaissance,
- Leesburg stormwater infrastructure maps,
- Available as-built drainage plans, and
- Information provided by Leesburg Environmental Services staff.

b. Drainage Basin Inventory

The Study Area consists of a 85 square mile area illustrated on Map VII-2, 17 primary drainage basins were defined within the Urban Service Area. These primary drainage basins were further divided into 319 sub-basins, which included "open" sub-basins, which have a positive surface discharge, and "closed" sub-basins, which have no positive surface discharge. Open sub-basins generally have a defined point of stormwater discharge, such as a storm sewer pipe or open channel. Discharge from closed sub-basins occurs through infiltration into the ground, evaporation and evapo-transpiration only.

1. Bentley

The Bentley drainage basin consists of 984 acres and is located in the eastern portion of the Study Area along the shore of Lake Griffin. Land use within the basin is comprised primarily of low, medium and high-density residential housing, recreational, undeveloped land and commercial (primarily along US 441). Type A soils are predominant (78%) in the basin.

Overall drainage from the basin is towards Lake Griffin. The sub-basins south of US 441 drain to the north through overland flow, ditches and culverts. The sub-basins north of US 441 are located along the shore of Lake Griffin and drain directly to the lake.

2. Carver Heights

The Carver Heights drainage basin consists of 932 acres and is located west of US 27/441 and north of W Main Street in the northwest portion of the Study

Area. Land use within the basin is comprised primarily of medium and high-density residential housing, institutional and undeveloped land and commercial. Approximately 60% of the basin is Type A soils, 14% is Type B/D and 17% is Type C.

Stormwater runoff generated within this basin generally drains to the east towards Lake Griffin. The sub-basins located west of US 441 drain through a set of culverts under the highway to the wetlands along the shore of Lake Griffin located north of N Shore Drive and east of US 441. The sub-basins located east of US 441 drain north to the same wetland system along the shore of Lake Griffin.

3. Carver North

The Carver North drainage basin consists of 1,008 acres located in the northwest portion of the Study Area (in the area previously referred to as the Myrtle basin). Land use within the basin is comprised primarily of low, medium and high-density residential housing, commercial, industrial and agriculture/rangeland. Types A and C soils are predominant (89%) in the basin.

The prevalence of well-drained soils **in this** drainage basin results in low stormwater runoff from the individual sub-basins. Stormwater runoff occurs during certain storm events primarily as overland flow that drains to the Carver Heights drainage basin.

4. Dyches Lake

The Dyches Lake drainage basin consists of 1,333 acres and is located in the west-central portion of the Study Area. The drainage basin is bordered on the south and west by Lake Denham, on the east by the Lake Hollywood drainage basin and to the north by Florida Midland Railway. Land use within this basin is comprised primarily of residential (34%), agriculture, forest and rangeland (36%) and open water/wetlands (13%). The basin-has an even mixture of Type A, B/D and D soils.

Stormwater runoff generated within this basin generally drains to the south towards the wetlands along the north shore of Lake Denham.

5. Harris Bayou

The Harris Bayou drainage basin consists of 1,013 acres of wetlands and open water associated with the bayou, and is located in the eastern portion of the Study Area between US 441 and Lake Harris. The bayou is currently a controlled basin with no flow to Lake Harris under most conditions. The SJRWMD and FDOT are

currently constructing a large box culvert under US 441 for a direct drainage connection between Lake Griffin and Lake Harris.

6. Lake Denham

The Lake Denham drainage basin includes the sub-basins that drain through the wetlands surrounding Lake Denham into the lake prior to discharge to Lake Harris through Helena Run. This drainage basin includes regulated discharge from the Turnpike WWTP and spray fields. Lake Denham drainage basin consists of 14,718 acres and is the largest basin in the Study Area. The predominant land use is wetlands and open water (49%) and agriculture forest and rangeland (38%). Residential land use makes up only 6 % of this basin.

7. Lake Griffin

The sub-basins located along the shore of Lake Griffin in the northwest portion of the Study Area that drain directly to the lake make up this 595-acre drainage basin. Land use is comprised of residential, commercial and undeveloped upland forest. Soils are primarily Type A (55%) in the upland areas and Type D (25%) along the shoreline.

8. Lake Harris

The sub-basins located along the shore of Lake Harris in the southeast portion of the Study Area that drain directly to the lake make up this 2,918-acre drainage basin. Land use is comprised of residential (39%), commercial and agriculture, forest and rangeland (38%). Wetlands along the shoreline make up 5% of the land use in these sub-basins. The predominant soils type in the upland areas of the basin is Type A (46%).

9. Lake Hollywood

The Lake Hollywood drainage basin consists of 797 acres and is located in the central portion of the Study Area between the Dyches Lake drainage basin and Lake Harris. Land use within this basin is comprised primarily of residential (57%), commercial (19%), open water/wetlands (10%) and institutional (9%). The predominant soils type in this drainage basin is Type A (76%).

Overall drainage from this developed basin is through culverts, channels and small lakes and ultimately to Lake Harris.

10. Palatlakaha River East

The Palatlakaha River East drainage basin is located in the southern portion of the study area bordering the east side of the Palatlakaha River. Due to future development proposed in this basin and the potential expansion of utility service for the City, this area was evaluated to establish base conditions. This drainage basin makes up one of the tributaries located south of the City that flow to the Palatlakaha River that drains to Lake Harris.

The Palatlakaha River East is 13,568 acres with a predominant land use of agriculture, forest and rangeland (58%). Open water/wetlands is 26% of the land use while residential is 11%. Soils in the drainage basin are 49% Type A and 32% Type B/D or D.

11. Palatlakaha River West

The Palatlakaha River West drainage basin is located in the southern portion of the study area bordering the west side of the Palatlakaha River. Due to future development proposed in this basin and the potential expansion of utility service for the City, this area was evaluated to establish base conditions. This drainage basin makes up one of the tributaries located south of the City that flow to the Palatlakaha River that drains to Lake Harris.

The Palatlakaha River West is 6,876 acres with a predominant land use of agriculture, forest and rangeland (63%). Open water/wetlands is 30% of the land use while residential is only 3%. Soils in the drainage basin are 36% Type A and 49% Type BID or D.

12. Pembrooke Fairways

The Pembrooke Fairways development and surrounding area make up this 1,412 acre drainage basin. The predominant land use is residential (34%). Agriculture, forest and rangeland account for 32% and open water/wetland is 20% of the land use. Soils in the drainage basin are 29% Type A, 29% Type C and 38% Type B/D or D. Stormwater drainage flows towards the wetlands surrounding Lake Denham.

13. Secret Promise

The Secret Promise Drainage basin is 3681 acres of undeveloped land located west of the Florida Turnpike and south of the Lake Denham drainage basin. This basin is permitted to become a medium density residential development. The development will be called Secret Promise and the proposed stormwater management system is permitted by the SIRWMD.

The existing land use within this basin is agriculture, forest and rangeland (61%) and open water/ wetland (37%). Soils in the drainage basin are 22% Type A and 60% Type B/D or D. Stormwater drainage flows towards the wetlands surrounding Lake Denham.

14. Sunnyside

The Sunnyside drainage basin consists of 1, 112 acres and is located in the northeastern portion of the Study Area along the shores of Lake Harris. Land use within the basin is comprised primarily of residential housing (31 %), agriculture, forest or rangeland (48%) and wetlands (21%). Type A soils are predominant (71%) in the basin.

Overall drainage from the basin is towards Lake Harris. Some of the sub-basins have connected, channelized flow to the lake while the sub-basins located along the shoreline drain directly to the lake.

15. Tally

The Tally drainage basin consists of 328 acres and is located in the northern portion of the Study Area along the shores of Lake Griffin. Land use within the basin is comprised primarily of residential housing (19%), commercial (25%), industrial (16%), forest or rangeland (20%) and wetlands (6%). Upland soils (Type A and Type C) are predominant (84%) in the basin.

Overall drainage from the basin is towards Lake Griffin. The developed sub-basins have culverted flow to the lake while the sub-basins located along the shoreline drain directly to the lake.

16. Venetian Gardens

The Venetian Gardens drainage basin consists of 814 acres and is located in the northeastern portion of the Study Area along the shores of Lake Harris. The Venetian Gardens is located between Lake Hollywood and Sunnyside drainage basins and includes most of downtown Leesburg. Land use within the basin is comprised of residential housing (31 %), commercial (22%), recreational (6%), institutional (7%) forest or rangeland (19%) and wetlands (7%). Type A soils are predominant (77%) in the basin.

Overall drainage from the basin is towards Lake Harris. Most of the drainage is through interconnected culverts to the lake. Sub-basins located along the shoreline drain directly to the lake.

17. Whispering Pines

The Whispering Pines drainage basin consists of 419 acres and is located in the north central portion of the Study Area. Land use within the basin is comprised primarily of residential housing (30%), commercial (48%) and institutional (7%). Type A soils are predominant (85%) in the basin. Overall drainage from the basin is towards Lake Griffin through interconnected culverts and channels.

Map VII- 2: Primary Drainage Basin Delineation

C. STORMWATER FACILITIES ANALYSIS

1. Level of Service

In 1982, the State of Florida began to require that new development provide stormwater treatment in response to concerns over urban stormwater quality and flooding. This provision commonly required the construction of stormwater management facilities such as dry retention ponds, roadside swales, and/or wet detention ponds to allow pollutants to be removed from the runoff. However, development that occurred prior to 1982 did not have these stormwater criteria at the time of construction. This pre-1982 development describes much of the development contained within the City's Urban Service Area. As such, much of the stormwater runoff from Leesburg's urban area receives little to no treatment prior to discharge from an individual site.

Since 1982, the City and the SJRWMD have developed criteria for the management of stormwater runoff. The 10-, 25-, 50- and 100-year, 24-hour storm events were selected in developing the design criteria for drainage facilities. These storm events were selected to provide level of service (LOS) standards for the drainage system facilities developed within the City of Leesburg and are summarized below:

- *Principal arterial bridges* – Protection from 100-year, 24-hour storm event
- *Other bridges* - Protection from 50-year, 24-hour storm event
- *Cross drains* - Protection from 25-year, 24-hour storm event
- *Storm sewers* - Flooding from 10-year, 24-hour storm event
- *Detention/retention structures* - Protection from 25-year, 24-hour storm event
- *Canals, ditches, roadside swales or culverts for stormwater external to developments* – Protection from 25-year, 24-hour storm event.
- *Canals, ditches, roadside swales or culverts for stormwater internal to developments* – Protection from 25-year, 24-hour storm event

Additionally, the City of Leesburg requires stormwater management systems to provide water quality treatment volumes. The criteria requires systems provide the volume of:

- 3.5" runoff from the impervious site area.

This treatment volume is required to be recovered within 72 hours of the storm event through controlled discharge or infiltration.

2. Existing Urban Service Area Facilities Analysis

The Stormwater Management Program and Master Plan completed for the City provided an analysis of the 17 primary drainage basins within the City's Study Area. The report ranked the priority of the basins for future detailed analysis and drainage improvements. The ranking of each basin was based upon an analysis of its hydrology and hydraulics conditions, a water quality assessment, and in consideration of known flooding problems within the basin. The hydrologic/hydraulic and water quality rankings were combined to produce a

final basin ranking. Table VII-1 details the hydrology/hydraulic ranking, the water quality ranking and the final ranking of each basin.

Whispering Pines Drainage Basin Study

The Whispering Pines Drainage Basin Study (1997) was first detailed drainage basin study conducted following the Planning Study. Detailed survey data of the stormwater conveyance system and infrastructure was collected including ditch cross sections, pipe diameters, and invert elevations that enabled the hydrologic and hydraulic analysis to be refined using the Storm Water Management Model (SWMM). Model analysis identified significant flood conditions between St. Paul's Catholic Church and the Winn Dixie Shopping Plaza; in Cauthen Circle between St. Paul's Catholic Church and the Seaboard Coast Line Railroad; and in areas north of US 441 around Fountain Lake and near Canal Street. Minor flooding was identified around the wastewater treatment plant and around Lake Park. The report provided recommended stormwater improvements including the construction of separate pond facilities at Canal Street and Lee Street and conveyance improvements upstream and downstream of Perkins Street. The recommended improvements were estimated to have the potential to benefit water quality by removing at least 85 % of the Total Suspended Solids.

Carver Heights Drainage Basin Study

The Carver Heights Drainage Basin was the second basin selected for detailed hydrologic and hydraulic analysis using SWMM (1998). The SWMM analysis identified significant flood conditions west of US 441 and south of Akron Drive and at several locations encompassed by Griffin Road to the north, and the CSX Railroad lines to the east and south. Improvements were recommended to alleviate flooding and reduce pollutant loads to Lake Griffin. The recommended improvements included the creation of pond facilities at McCormick Street, Johns Avenue, and at Birchwood Circle in addition to conveyance system improvements.

Tally Drainage Basin Study

In 1998, the City became aware of information regarding household flooding in the Tally Basin, and elevated the Tally Basin above the Lake Hollywood Basin for completing a detailed drainage study. The Tally Basin drainage study (2001) included survey data of the stormwater structures and conveyance systems and a detailed hydrologic and hydraulic analysis using SWMM. The report provided recommended stormwater improvements to alleviate flooding in the Woodland Heights Subdivision upstream of the CSX railroad and downstream of the CSX railroad to alleviate flooding in the Palm Ridge Mobile Home Park. The recommended improvements included the enhancement of natural retention areas, construction of inlets, and conveyance installations and replacements.

Lake Griffin Basin Drainage Evaluation

Lake County sponsored a watershed management study of the Lake Griffin basin in 2003 with the goal of reducing the load of pollutants to the lake, specifically phosphorous and Total Suspended Solids. The study provided an update to the County's inventory of drainage outfalls to Lake Griffin and the delineation of sub-basins associated with each outfall. A detailed hydrologic and hydraulic flood analysis was not performed. The drainage evaluation identified seven sub-basins for further evaluation and project implementation, only one of which is located within the City of Leesburg. The sub-basin identified in the City of Leesburg is part of the Bentley Basin, located in the eastern part of the City. The drainage evaluation recommended the installation of an exfiltration trench and the expansion of a retention pond to improve treatment to stormwater water runoff from the sub-basin.

Lake Harris Basin Drainage Evaluation

Lake County funded a water quality assessment of the Lake Harris and Little Lake Harris basins. The study provided an update to the County's inventory of outfalls to Lake Harris and Little Lake Harris and the hydrologic basin limits directly discharging to the lakes. A hydrologic and hydraulic flood analysis was not conducted. A Non-Point Source Loading and Management (NPSLM) model was prepared to evaluate pollutant loadings to the lake and rank sub-basins as to those with the greatest pollutant load to the lakes (ERD 2006). The study identified ten basins for further evaluation, five of which are located within the City of Leesburg Study Area. The basins identified as major pollutant contributors are located in the Venetian Garden basin and the Lake Hollywood basin. The Lake Harris Basin Drainage Evaluation does not provide recommended improvements for pollutant reductions.

Palatlakaha River Basin Hydrologic and Hydraulic Study

The Lake County Water Authority funded a study in 1992 to evaluate the hydrologic characteristics of the Palatlakaha River Basin and the existing water control structure regulation plan. The purpose of the study was to develop a means of assessing and regulating impacts of proposed development throughout the river and a means of evaluating the operation of the existing or future water management structures (dams).

The report provided cross-section data from the dam at Bridges Road (Structure M-5) through the dam at CR 48 (Structure M-1). Structure M-5 is the upstream boundary of the Leesburg Study Area. The report provided recorded stage information at Structure M-5 that was used to establish boundary condition flow rates used in the Master Plan hydrologic and hydraulic model.

In addition to the known problem flooding areas, Leesburg contains various areas which have been identified as areas of 100-year flooding as identified by National Flood Insurance

Rate Maps. Flood zone maps found in the Conservation Element of this Growth Management Plan identify these areas. The City of Leesburg protects the flood zones by mandating that no development shall result in an increase in the 100-year flood elevation. Development and placement of fill within the floodplain is allowed provided an equal volume of compensating storage is provided above the ordinary high water table and below the 100-year flood elevation. In addition, the City requires that fill placed within the floodplain shall not reduce the capacity of the floodway or increase the base flood elevation, either upstream or downstream.

3. Future Demand and Facility Improvements

The Phase 3 Stormwater Report prioritized Leesburg's ten (17) primary basins for future analysis. To date, detailed drainage analyses have been completed for all of the seventeen primary basins: Bentley, Carver Heights, Carver North, Dyches Lake, Harris Bayou, Lake Denham, Lake Griffin, Lake Harris, Lake Hollywood, Palatkaha River East, Palatlakaha River West, Pembrooke Fairways, Secret Promise, Sunnyside, Tally, Venetian Gardens, and Whispering Pines. The results of these detaliled analysis can be found in the City of Leesburg Stormwater Management Program and Master Plan January 2008 (BMAP).

4. Best Management Practices (BMPs)

Best Management Practices (BMPs) include structural controls, non-structural controls, and operation and maintenance (O&M) procedures used to reduce flooding and the discharge of pollutants to receiving water bodies. Non-structural BMPs include activities and policies adopted by the City's Environmental Services Department that reduce or prevent pollutants from entering the stormwater. Non-structural BMPs includes items such as the City's street sweeping program, impervious area reduction measures to reduce runoff, the City's maintenance program to maintain the operations of structural BMPs (such as stormwater inlet and basin cleaning) and the City's NPDES Public Education program (such as education on proper fertilizer application). Structural BMPs reduce stormwater runoff quantity and quality through use of a specific device or storage structure.

As the priority basins identified within the City's Master Stormwater Plan are further analyzed and proposed drainage facilities improvements are constructed, many of the drainage issues and problem areas identified above should be alleviated to the extent required to meet the desired LOS established by the City of Leesburg.

In addition to studying the drainage basins, the Stormwater Management Program and Master Plan provided details of the City's existing stormwater facility maintenance program:

a. Street Sweeping Program

The primary function of a street sweeping program is to remove trash, tree organic materials, and pollutant solids from roadways within the Urban Service Area. Currently, the

City's street sweeping program sweeps all City streets and the Airport twenty-seven (27) times per year.

b. Swale Maintenance Program

Portions of the Urban Service Area rely on roadside swales for collection and transmission of stormwater runoff. These swales, which also provide water quality benefits through infiltration, often become filled in or blocked in some manner over time. Regular maintenance and citizen education would ensure the proper functioning of these facilities. Currently, the City cleans and restores swales on an as needed basis.

c. Drainage Facilities Maintenance

Removal of sediments and organic material from inlet grates and catch basins maintains the capacity of the drainage facilities while reducing the quantity of pollutants and organics discharged into the receiving water bodies. The City cleans storm inlets on a regular basis.

d. Stormwater Main Line Cleaning

The Stormwater Division periodically cleans sections of the City's stormwater sewer by jetting water in one end of a section of pipe and vacuuming the water out at the other end with a vacuum truck. Cleaning typically occurs as corrective maintenance, such as when the sewer line or a nearby stormwater structure is repaired, or when flooding is reported due to a blocked stormwater inlet or grate. When the condition of the pipe is in question, the Stormwater Division uses a camera to view and record the section of pipe that is cleaned.

e. Preservation of Natural Depressional Areas

Numerous natural depressional areas exist throughout the Urban Service Area. These areas retain stormwater runoff infiltrating a portion of the runoff into the ground thereby providing water quality benefits as well as reducing downstream peak discharge rates. Preservation and/or acquisition of these areas should be considered.

f. Stormwater Best Management Practices

Stormwater BMP's, such as proper erosion control measures, inlet protection, etc., could be adopted to improve the quality of stormwater runoff and reduce the quantity of organics and suspended solids within runoff.

5. Stormwater Retrofit Projects Identified in BMAP

The City of Leesburg is a major stakeholder in the development of the Basin Management Action Plan (BMAP) for the Upper Ocklawaha River Basin. Stormwater projects that the City identified to be included in the BMAP for pollutant load reduction to Lake Harris, Lake Griffin and the Palatlakaha River are described below:

Lakeshore Drive Stormwater Project Venetian Gardens Basin:

Project was designed to reduce nutrient loading in Lake Harris. The project completed in 2003

Whispering Pines Basin Regional Stormwater Retrofit Project:

The project is construction of a 10 acre wet detention pond to reduce nutrient loading in Lake Griffin. The project was completed in 2008.

Johns Avenue Pond Facility, Carver Heights Drainage Basin

The project was designed to reduce local and upstream flooding in the area. The project has been completed.

McCormak Pond Facility, Carver Heights Drainage Basin

The McCormak pond Facility is located between McCormack street and the CSX track It was designed to reduce local flooding and eliminate open ditch drainage. The project was completed.

BMP No. 1 Venetian Gardens drainage basin

Venetian Gardens water quality improvement project. This project is designed to reduce the pollutants that discharge into Lake Harris through the Venetian Gardens canals.

BMP No. 2 Lake Griffin Drainage Basin

Canal Street WWTP water quality improvement project. This BMP retrofit project is proposed to reduce sediment, oil/grease and floating debris from one of the Lake Griffin sub-basins.

BMP No 3. Whispering Pines Drainage Basin

Lee Street Regional Stormwater Facility. The goal of the project is to mitigate areas of problem flooding in the drainage basin, address safety issues, and reduce pollutant loading to Lake Griffin

BMP No. 4 Whispering Pines Drainage Basin

Canal Street Wet Dentition Pond. The goal of the project is to mitigate areas of problem flooding in the drainage basin, address safety issues, and reduce pollutant loading to Lake Griffin

BMP No. 5 Whispering Pines Drainage Basin

Canal Street Wet Detention Pond. This BMP retrofit project is proposed to reduce nutrient and sediment loading to Lake Lucerne from sub-basin LH-0100.

BMP No. 5 Lake Hollywood Drainage Basin

Lake Lucerne Flood Abatement and Water quality improvement project. This BMP retrofit project is proposed to reduce nutrient and sediment loading to Lake Lucerne from sub-basin LH-0100.

BMP No. 6 Lake Hollywood Drainage basis

Feasibility Analysis of Engineered Wetland System. Pollutants would include sediment, trash and debris, foliage, dissolved nutrients and oil/grease. Treatment of the stormwater runoff flowing through the open cut ditch system in sub-basin LH-0090 would provide the City with a cost effective opportunity to install one treatment system that could potentially remove a large pollutant load discharging to Lake Harris.

BMP No. 7 Lake Griffin Drainage Basin

Engineered Wetland Treatment System. The proposed retrofit project includes construction of a wetland system for water quality enhancement and reduction of local flooding.

BMP No. 8 Venetian Gardens Drainage Basin

Urban Wetland Park. The concept for this proposed BMP includes construction of a wet detention pond treatment system combined with an urban park for the citizens of Leesburg.

BMP No. 9 Lake Hollywood Drainage Basin

Flamingo Road Pond Treatment System. The concept for this BMP project involves removing sediment build-up in the pond, digging a deeper bottom at the north inlet culvert, installing an outfall structure to increase attenuation within the pond, and aquatic vegetation management.

BMP No. 10 Lake Denham Drainage Basin

Feasibility analysis to purchase and Restore JaMar Muck Farms. Proposed BMP No. 10 involves the purchase of the Ja-Mar muck farm, modification of runoff from the irrigation ditches and restoration of the wetland area.

BMP No. 11 Carver Heights Drainage Basin

Birchwood Circle Regional Pond Facility. This BMP project was proposed in the 1998 Carver Heights Drainage Basin Study to reduce both the potential and the duration of flooding within the Carver Heights Drainage Basin. The project will provide additional stormwater treatment prior to discharge to Lake Griffin.

Table VII-1: Prioritization of 1996 Drainage Basins

Rank	Flood Potential (Highest to Lowest)	Pollutant Load Per Acre (Highest to Lowest)	Priority in 1996 (Highest to Lowest)	Revised Priority in 1998 (Highest to Lowest)
1	Carver Heights	Lake Hollywood	Carver Heights	Carver Heights
2	Whispering Pines	Carver Heights	Whispering Pines	Tally
3	Venetian Gardens	Montclair	Lake Hollywood	Whispering Pines
4	Lake Hollywood	Myrtle Lake	Venetian Gardens	Lake Hollywood
5	Montclair	Whispering Pines	Montclair	Venetian Gardens
6	Dyches Lake	Tally	Dyches Lake	Montclair
7	Bentley	Venetian Gardens	Tally	Dyches Lake
8	Tally	Dyches Lake	Myrtle Lake	Myrtle Lake
9	Myrtle Lake	Bentley	Bentley	Bentley
10	Sunnyside	Sunnyside	Sunnyside	Sunnyside

Table VII-2: Stormwater Master Plan Major Drainage Basins

Basin Name	Abbreviation*	Number of Sub-basins	Area (acre)	% Total Area (acre)	Receiving Water Body
Bentley	B	14	984	1.9	Lake Griffin
Carver Heights	CH	29	932	1.8	Lake Griffin
Carver North	CN	8	1.008	1.9	Lake Griffin
Dyches Lake	DL	14	1,333	2.6	Lake Denham
Harris Bayou	Harris Bayou	1	1,013	1.9	No Flow
Lake Denham	D	39	14.718	28.0	Lake Harris
Lake Griffin	6	9	595	1.1	Lake Griffin
Lake Harris	11	23	7.918	5.6	Lake Harris
Lake Hollywood	LI I	18	797	1.5	Lake Harris
Palatlakaha River East	PE	36	13,568	25.8	Palatlakaha River / Lake Harris
Palatlakaha River West	PW	18	6,876	13.1	Palatlakaha River / Lake Harris
Pembrooke Fairways	PF	12	1.412	2.7	Lake Denham
Secret Promise	**SP**	16	3,681	7.0	Lake Denham
Sunnyside	SS	6	1,112	2.1	Lake Harris
Tally	T	38	328	0.6	Lake Griffin
Venetian Gardens	VG	15	814	1.6	Lake Harris
Whispering Pines	**WP**	1	419	0.8	Lake Griffin
Total	**17 Basins**	**319**	52,508	**100.0**	

*Note that the Tally, Whispering Pines, Carver Heights and Secret Promise Sub-basin information were obtained from existing studies.

6. Capital Stormwater Improvements Funding

The City of Leesburg has an established Stormwater Utility Fee that provides funding for operation of the stormwater management program and for construction of capital improvement projects. However, increasing regulatory requirements for pollutant removal from impaired water bodies place a financial burden on the City. Several sources

of grant funding are available to the City to support their effort in reducing pollutants in stormwater runoff. A brief discussion is provided.

County

The Lake County Water Authority (LCWA) provides grant funding for new and retrofit stormwater improvement projects. These funds will pay for land purchase as well as construction costs.

State

The FDEP funds stormwater retrofit projects through their TMDL Water Quality Restoration Grant. Funds are only available for projects that affect waters listed on FDEP 303(d) list of impaired waters, which includes Lake Harris, Lake Griffin and the Palatlakaha River.

Federal

The U.S. Environmental Protection Agency (EPA) provides grant funding for prevention of non-point source water pollution under Section 319 of the Clean Water Act. The DEP Non-point Source Management Section administers the grant money received from the EPA through Section 319, which is referred to as 319 Grant Funds. Grant funds are to be used to implement projects to reduce non-point sources of pollution such as stormwater runoff.

D. GOALS, OBJECTIVES, AND POLICIES

GOAL 1: Provide a stormwater management system of appropriate capacity to protect the life and property of the citizens of Leesburg, as well as decreasing adverse environmental impacts attributable to stormwater runoff.

Objective 1.1: ***Flood Control.*** The City shall achieve and maintain the following adopted stormwater management level of service standards that shall meet or exceed state and federal regulations for stormwater quality and quantity.

Policy 1.1.1: New development and redevelopment issued a development order shall meet the standards established by the Stormwater Management Ordinance, Chapter 28 of the City Code of Ordinance as follows:

- Principal arterial bridges – Protection from 100-year, 24-hour storm event
- Other bridges - Protection from 50-year, 24-hour storm event
- Cross drains - Protection from 25-year, 24-hour storm event
- Storm sewers - Flooding from 10-year, 24-hour storm event
- Detention/retention structures - Protection from 25-year, 24-hour storm event
- Canals, ditches, roadside swales or culverts for stormwater external to developments – Protection from 25-year, 24-hour storm event.
- Canals, ditches, roadside swales or culverts for stormwater internal to developments – Protection from 25-year, 24-hour storm event

Policy 1.1.2: New development and redevelopment issued a development order shall meet the standards established for water quality by the Stormwater Management Ordinance, Chapter 28 of the City Code of Ordinance.

Policy 1.1.3: At a minimum, the peak post-development runoff rate for stormwater management system shall not exceed the peak pre-development runoff rate for a 3.5-inch, one-hour storm event. The recovery time for the retained volume shall be less than 72 hours.

Policy 1.1.4: If downstream facilities (from the positive outfall of the development) are inadequate to convey the peak discharge for the design storm event, the development shall be required to accommodate its proportion of basin runoff rate above the downstream systems actual capacity.

Policy 1.1.5: Stormwater treatment shall be required to serve the development through a stormwater treatment system which is site-specific; or serve sub-areas of the City and, if applicable, Lake County. Regardless of the

area served, the stormwater treatment system must provide a level of treatment which meets the requirements of the Florida Administrative Code (F.A.C.), the City of Leesburg Code of Ordinance, and the criteria of the St. Johns River Water Management District.

Objective 1.2: ***Stormwater Master Plan.*** The City shall maintain a Stormwater Master Plan which establishes high water elevations, addresses existing deficiencies, and coordinates the construction of new and replacement facilities.

Policy 1.2.1: The City shall maintain a detailed inventory and analysis of the existing drainage facilities within its municipal boundaries in the City's Stormwater Master Plan.

Policy 1.2.2: The City shall maintain a digital map of the drainage facilities within the City and require new developments to provide copies of their stormwater design for incorporation into the City's digital map.

Policy 1.2.3: At a minimum, the City shall utilize the expertise of a professional engineer to run models of the City's stormwater system based upon critical design storm events and update the Stormwater Master Plan every five (5) years. Areas that have been annexed into or adjacent to the City's Urban Service Area since the time of the last study shall also be included in this analysis.

Policy 1.2.4: The Stormwater Master Plan shall include review of stormwater quality discharged into surface water bodies and recommendations for needed improvements.

Policy 1.2.5: The Stormwater Master Plan shall establish priorities for stormwater system replacements, insuring correction of existing drainage facility deficiencies, and providing for future facility needs.

Policy 1.2.6: The City shall maintain its stormwater utility fund and shall adjust the rate fees every three (3) years to provide for inflation and increase construction costs.

Policy 1.2.7: Annually, the City shall rely on the Stormwater Master Plan to prepare the City's annual budget for funding of stormwater facility replacement and deficiency upgrades.

Policy 1.2.8: The City shall utilize the Stormwater Master Plan for preparation of the five (5) year Capital Improvement Plan to correct existing deficiencies and prepare for future stormwater demands.

Objective 1.3: ***Flood Plain.*** The City shall restrict development within the 100-year floodplain to those uses, which will not adversely affect the capacity of the floodplain to store water.

Policy 1.3.1: The City Code of Ordinances shall require compensating storage volumes for floodwater displaced by development. Compensating storage volumes shall be provided above the high water table elevation and below the elevation of the 100-year flood.

Policy 1.3.2: The City shall require the finished floor elevation of all structures within the flood plain to be a minimum of eighteen (18) inches above the 100-year flood elevation and twelve inches above the crown of the adjacent street.

Policy 1.3.3: Where feasible, the floodplain shall be reserved for conservation, open space and recreation uses to preserve the natural flow of runoff.

Policy 1.3.4: The City shall strive to protect and/or acquire natural depressional areas within its Urban Service Area to protect existing flood storage volumes.

Objective 1.4: ***Development Impacts.*** The City shall protect natural resources and the existing municipal stormwater network from the impacts of development and construction.

Policy 1.4.1: The City will continue to maintain a stormwater utility fee to provide funding for the maintenance and operations of stormwater facilities within the City of Leesburg. The City shall update the stormwater utility fee every three years.

Policy 1.4.2: The City shall review detailed calculations for new projects prepared by a registered professional engineer which show that retention and detention will be accomplished to meet the adopted level of service, and that there will be no negative impacts to downstream water quality or quantity.

Policy 1.4.3: The City shall review the characteristics and limitations of soil types for new projects with regard to percolation and infiltration.

Policy 1.4.4: The City shall review the impacts of proposed topographical changes for new development.

Policy 1.4.5: The City shall review the impact proposed stormwater system shall have on adjacent native vegetation and/or wetlands.

Policy 1.4.6: The City shall require that erosion and sediment control practices be utilized to protect water bodies, wetlands and watercourses from siltation during construction activities.

Policy 1.4.7: The City shall require adequate easements for stormwater system maintenance and conveyance.

Policy 1.4.8: New developments and redevelopment will be required to accommodate upland flow, which presently discharges through the site.

Objective 1.5: ***Intergovernmental Coordination***. The City of Leesburg shall educate citizens and coordinate with applicable jurisdictions to address stormwater issues of mutual concern and to provide adequate levels of service.

Policy 1.5.1: The Stormwater Master Plan shall be developed in coordination with Lake County and regulatory agencies, such as the Florida Department of Environmental Protection, the St. Johns River Water Management District, and the Florida Department of Transportation.

Policy 1.5.2: The Stormwater Master Plan process will include public participation review of the plan by affected citizens and City Advisory Committees.

Policy 1.5.3: Maintain a complaint monitoring system to log complaints and initiate work orders for corrective actions and audit monthly activity reports generated for performance evaluation.

Policy 1.5.4: The City will support the St. Johns Water Management District's Surface Water Improvement and Management (SWIM) program regulations, with specific emphasis on Lake Griffin and Lake Harris.